Claims 1-18, 20, 22 and 25-27 are pending in the application.

Claims 1, 7-8, 11-13, 22 and 25-27 are amended above to overcome the examiner's claim objection, the section 101 rejection of claim 25 and the claim rejections under the first and second paragraph of section 112.

The specification is amended above to delete the December 30, 2009 specification amendments.

No new matter has been added to the application by way of these specification and claim amendments.

I.   THE SPECIFICATION

The examiner objected to the amendments that Applicant made to the specification in its December 30, 2009 Office Action Reply for adding new matter to the application.

The examiner's objections are overcome by amending the specification above to delete the December 30, 2009 specification amendments.

II.   THE CLAIM 26-27 OBJECTIONS

The examiner objected to claims 26-27 because it is not clear whether or not the claims are independent or dependent claims.

Claims 26-27 are clearly drafted as dependent claims. However, the claims are amended above to make it abundantly clear that they are dependent claims.

III.   THE SECTION 101 REJECTION OF CLAIM 25

The examiner rejected claim 25 for being directed to non-statutory subject matter.

The rejection of claim 25 has been overcome by amending the claim to make it clear that the claim is directed to a non-transitory computer readable medium that includes instructions for performing the claimed method.

IV.   THE SECTION 112 FIRST PARAGRAPH REJECTIONS

The examiner rejected claims 1-18, 20, 22 and 25-27 under the first paragraph of Section 112 for a variety of reasons. The examiner rejections are overcome or they are traversed as follows:

- The rejection of the claims on the basis that the specification does not support the feature of "defining respective regions of specified extent with the image around said locations" has been overcome by amending the claims to read "defining respective local regions of interest" which, the examiner noted in the Final Rejection, is supported by the specification.

- The rejection of claim 1 because the "computer or processor" language is not supported by the specification. The examiner's rejection is traversed. The specification at page 5, lines 6-8 specifically recites using a computer or dedicated hardware to perform the invention. In addition to reciting the use of a computer, the broad term "dedicated hardware" is sufficient to support our recitation of "computer or processor" in the claims. Furthermore since the invention is referred to as a "process" and comprising "processing stages" repeatedly throughout the specification then "processor" seems to be a particularly apt description of hardware to implement it Therefore, the specification provides support for this feature of claim 1 and the examiner's rejection should be withdrawn.

- The rejection of claims 1-18, 20, 22 and 26-27 for non-enablement is also traversed. The specification discloses the following at page 5, lines 6-8:

The process can be performed in a suitably programmed personal computer (PC) or other general purpose computer of suitable processing power or in dedicated hardware.

This excerpt as well as other specification excerpts and the original application claims are sufficient to apprise one skilled in the art at the time of the invention how to practice the invention using a computer or processor. For at least this reason, the examiner's rejection of the claims for non-enablement should be withdrawn as well.

V. THE SECTION 112, SECOND PARAGRAPH REJECTIONS

The examiner rejected claims 1-18, 20, 22 and 25-27 for being indefinite for lacking antecedent basis for certain claim terms.

The Applicant's have overcome the examiner's rejection by amending the claims above generally as the examiner suggested to provide the proper antecedent basis for the identified claim terms.

VI. THE OBVIOUSNESS REJECTIONS

Claims 1-14, 17-18, 20, 22 and 25-27 stand rejected for being obvious over the Netsch Article ("Netsch") in view of the Madachy Article ("Madachy"). Claim 15 stands rejected for being obvious over Netsch in view of Soni et al. (USP 5,363,850). Claim 16 stands rejected for being obvious over Netsch in view of DeLong (USPA 2002/0012466). All pending claims are non-obvious and patentable because the cited prior art does not disclose every claim feature.

A. The Examiner's Obviousness Rejections

Independent claims 1, 22 and 25 are pending in the application. The examiner has rejected each independent claim for obviousness over Netsch in view of Madachy. It is the examiner's position that Netsch discloses all of the features of each independent claim except for the step of estimating the curvature of at least one respective said contour within respective said regions in producing a measure of any concavity thereof. It is the examiner's further position that Madachy discloses the claim features. The examiner justifies combining the references on the basis that one of ordinary skill in the art at the time of the invention would have made the combination in order to provide automated detection of microcalcifications as suggested by Netsch.

B. The Cited Art Does Not Disclose Independent Claim Steps (b) or (c)

Independent claims 1, 22 and 25 are non-obvious and patentable at least because the cited prior art does not disclose or suggest claim steps (b) and (c). The examiner cites Netsch as the primary reference in the obviousness rejection. The stated aim of Netsch is the detection of microcalcifications in digitized mammograms. (See Netsch Abstract at page 774 and the METHOD section at page 776). Netsch's aim is achieved by a method comprising the steps of (1) finding bright, almost circular spots in the mammogram; (2) estimating the size D and local

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contrast C of each spot; and (3) marking (that is to say labeling or classifying) a spot as a microcalcification if $C>C_T(D)$ where C_T is a given threshold depending on the estimated size D of the spot. The "finding" step (1) is performed by the application of a two dimensional Laplacian filter which does have some similarity to the applicant's process in its "Location of candidate cell nuclei" section and to claim step (a). This is, however, where the similarity of Netsch's method to Applicant's claims 1, 22 and 25 ends.

Independent claims 1, 22 and 25 are non-obvious and patentable at least because the cited prior art does not disclose or suggest the amended claim steps: (b) defining respective local regions around those of said objects which have said specified intensity and size characteristics; or (c) deriving from data within respective said regions one or more respective closed contours comprising points of equal intensities. With regard to step (b), the examiner appears to believe that "mark a spot" in step (3) of Netsch on page 776 somehow refers to defining a region within the image around the location of a spot (i.e. object) which has been found in Netsch's step (1). However, the cited Netsch excerpt teaches nothing of the sort. What the cited Netsch excerpt teaches is that the spot is labeled or classified as being a microcalcification if it satisfies the $C>C_T(D)$ criterion specified in step (3) of the reference. Thus, the cited excerpt of Netsch discloses the final step of Netsch. Moreover, Madachy does not supply this missing Netsch teaching. Finally, if the final step of Netsch is akin to step (b) of the claimed invention as the examiner maintains, then it would be impossible for Netsch to disclose or suggest the remaining steps of the claimed invention.

The independent claims are further non-obvious and patentable because the cited prior art does not disclose step (c) of each independent claim. The Examiner appears to believe that Netsch's Figure 3, equations (1)-(4) and references to "circularly-symmetric Gaussian function" and "Gaussian function is a type of a probability density function" refers to the derivation of closed contours comprising points of equal intensities from data within respective regions of the image as claimed. The Applicant wishes, at the outset, to point out that nowhere in Netsch could they find a statement or discussion about "Gaussian function is a type of probability density function" as quoted by the examiner. Therefore, the examiner has not made out a *prima facie* case of obviousness to the extent that the examiner's obviousness rejection relies upon this phantom teaching of Netsch. Moreover, the examiner's rejection cannot be sustained because the

cited prior art and in particular Netsch does not disclose this claim step. That is at least because the circle seen in Figure 3, equations (1)-(4), and the quoted expressions all refer to characteristics of the *filter* which is applied by Netsch to find the desired spots in the first place - similar to claim step (a). The cited Netsch portions do not in any way teach the derivation of contours from data within regions of the *image* as claimed in applicant's subsequent step (c). Note for example that Figure 3 of Netsch is labeled as "Cross-section of the 2-D Laplacian filter with the *xz* plane for scale *h*=5 and the corresponding view on the *xy* plane. The circle indicates the intersection of the lobe with the plane." Once again Madachy does not disclose this missing Netsch teaching. For this reason as well, independent claim 1 is non-obvious and patentable.

The Examiner acknowledges that Netsch does not disclose claim step (d) and turns to Madachy for this alleged disclosure. The Applicant has provided extensive reasons why Madachy does not disclose step (d) in their prior responses, some of which are reiterated below.

It is the examiner's position that the curvature R(i) at points around the contour as mentioned in the SHAPE section of Madachy discloses the claim 1 step (d) feature of producing a measure of concavity of at least one respective contour. However, the individual values of curvature around the contour as described in Madachy are not themselves a <u>measure</u> of concavity of the contour. While Madachy indicates that a set of curvatures is used to derive so-called "bending energy" there is no express disclosure of using curvature data to produce a measure of *concavity* of the contour.

Even though the measurement of curvature R(i) at points around the contour of Madachy *could* result in a measurement of concavity, if the curvature data was suitably processed to do so, Madachy does not disclose or suggest that this is or should be done. The measurement of curvature alone does not result in a measurement of concavity and the most important point is that Madachy does not teach that you should use that data to measure concavity. So Madachy does not expressly disclose a measure of concavity. For this reason too each independent claim cannot be obvious over Netsch et al in view of Madachy et al as asserted by the examiner.

C. **The Examiner Has Not Made Out A *Prima Facie* Case Of Obviousness**

All claims are also non-obvious and patentable because the examiner has not made out a *prima facie* case of obviousness for at least two reasons. Firstly, the examiner has not provided a factual basis that sets forth how one skilled in the art would combine the teaching of Netsch and

Madachy to reach the claimed invention. Secondly, one skilled in the art at the time of the invention would consider the combination of Netsch and Madachy to be illogical.

All independent application claims are non-obvious because the examiner has not provided a complete factual basis for the obviousness rejection. In particular, the examiner alleges the following about Netsch and Madachy:

probability density function"). However, all the claim limitations are not disclosed by Netsch. However, Madachy discloses using a computer or processor for performing (METHOD, page 373, "Gould/Denaza IP8500 image processor on a VAX host") and (d) estimating the curvature of at least one respective said contour within respective said regions and producing a measure of any concavity thereof (SHAPE, pages 373, "R(i)" and "curvature").

This is the only explanation given for combining Madachy with Netsch. The explanation is factually incomplete and does not make out a *prima facie* case of obviousness at least because the examiner has not explained what Netsch data would be manipulated in the Madachy computer nor has the examiner explained what the results of that manipulation would be. Without this information, the applicant is left to guess about how the examiner is combining the prior art to reach the claimed invention. Therefore, the examiner's obviousness rejection cannot be maintained for this reason as well.

A further reason why all claims are non-obvious and patentable is because the combination of Netsch and Madachy does not logically lead to the claimed invention. According to MPEP §§ 2142 and 2143, it is the Examiner's burden to establish a *prima facie* case of obviousness by clearly articulating reasons with rational factual underpinnings to support the conclusion of obviousness. The examiner has not met this burden here because the problems solved by the two references are so different that it would have been illogical for a person of ordinary skill in the art faced with the prior art to combine the references as the examiner has.

The dramatic differences between the references are seen quite clearly from the purposes of the two methods. The object of Netsch is to detect microcalcifications in digital

mammograms, for which purpose it is necessary to find bright, almost circular spots in the mammogram (Netsch method step (1) on page 776 of the reference). The object of Madachy, on the other hand, is to identify mitotic cells in cervical biopsies (see title, Abstract and references to mitotic cells throughout the reference). Mitotic cells are cells which are undergoing division and Madachy seeks to distinguish such cells from those in interphase (see INTRODUCTION in the reference). For this reason Madachy computes various descriptors of the cell images as described under SHAPE and TEXTURE in the reference. None of these are anything like the bright, almost circular spots sought by Netsch, however, because mitotic cells have a very different appearance to microcalcifications and in particular are not "almost circular" but are characterised by jagged edges as indicated in the last sentence of Madachy's SHAPE section and as seen in Figure 2 of the reference. It would not, therefore, have been obvious or logical to one of ordinary skill in the art at the time of the invention to apply features of Madachy's method to Netsch's method to provide automated detection of microcalcifications as suggested by Netsch because Madachy is concerned with a different problem requiring the detection of different kinds of objects in the image to those with which Netsch is concerned.

Claims 2-18, 20, 22 and 25 all depend on claim 1, or recite the same limitations as claim 1, and hence are patentable for at least the same reasons as discussed above in relation to claim 1.

The examiner's rejections of claims 15-16 appear to be incomplete. In rejecting claim 1, the examiner noted that Netsch does not teach claim 1 step (d). Claims 15-16 depend upon claim 1. However, the examiner has not cited Madachy in rejecting claims 15-16. Therefore the examiner, at the very least, has not made out a *prima facie* case of obviousness of claims 15 or 16 because there is no showing of where step (d) of claims 15-16 is found in the prior art.

CONCLUSION

Entry of the specification and claim amendments above is respectfully requested because it will reduce the issues on appeal.

Respectfully submitted

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